

Measurement of Carbon Compounds in Water

Total organic carbon (TOC) and purgeable organic carbon (POC) measurements are obtained using this technique. Determination of carbonate, bicarbonate, and carbon dioxide in water is also possible via measurement of total inorganic carbon (TIC). The total dissolved carbon (TC) is obtained directly or by summation if $POC = 0$.

Principle of Technique

TIC and TOC are measured in sequence with an automated instrument. TIC is determined by measuring the CO_2 released when the sample is acidified. Carbonate and bicarbonate are converted to CO_2 , which, together with any CO_2 originally in the sample, is carried into an infrared analyzer for measurement. TOC is determined by measurement of the CO_2 released by chemical oxidation of the organic carbon in the sample. POC is determined by the addition of a furnace and purgeables trap to the analysis train, or by difference [$POC = TC - (TIC + TOC)$].

Samples

Form. An aqueous solution is needed.

Size. Sample size ranges from 0.3 to 10 mL for pumped injection; 5 μ L may be analyzed if syringe injection is used.

Preparation. Samples can be analyzed as received or after dilution.

Limitations

The analysis range for TOC is 0.05 to 10,000 ppm carbon and 0.02 to 10,000 ppm carbon for TIC. For TOC, the precision is 2% or 2 ppb carbon (whichever is greater), and for TIC, it is 1% or 0.5 ppb carbon.

Very acidic solutions ($pH < 1$) must be neutralized before analysis. Special methods are needed to accurately analyze solutions with high chloride or organic chloride content.

Estimated Analysis Time

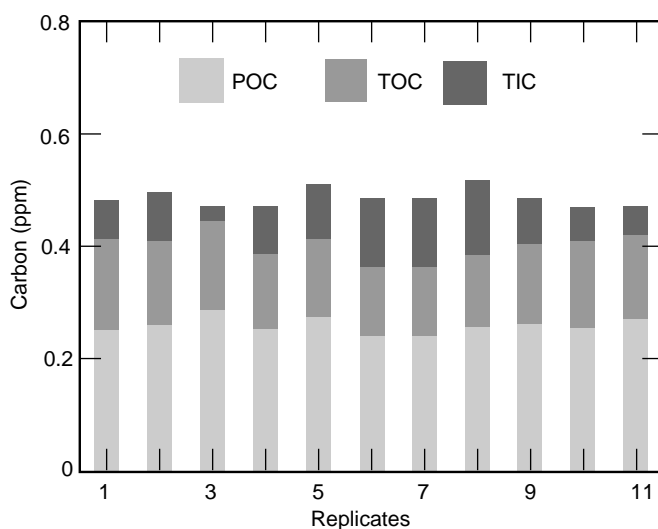
Between 1 and 2 h is needed to prepare standards and set up the instrument. After preparation and setup, about 4 to 8 samples per hour can be analyzed.

Capabilities of Related Techniques

Carbonate species in aqueous solution can also be measured by titration, by an acid-evolved CO_2 determination, or by means of an ion-selective electrode. These other techniques may be more accurate than the measurement of carbon compounds in water, but they require much larger samples and are subject to more interferences.

Examples of Applications

- Measurement of TOC for water pollution abatement studies.
- Characterization of ground waters in geochemical studies.
- Characterization of high-purity water.
- Measurement of carbonate and bicarbonate in solutions from HE detonation calorimetry.



Laboratory de-ionized water contains carbon at less than ppm concentrations. POC was obtained by difference; the repeatability shown is typical.

IR cell detection TOC data vs
linearized TOC data.
(Linearization constants do
not need updating; they are
calculated automatically).

